



SDMS DocID 000225033

New Bedford
4.4
385033

EPA WORK ASSIGNMENT NUMBER 04-1L43

EPA CONTRACT NUMBER: 68-01-7250

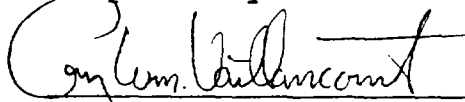
EBASCO SERVICES, INCORPORATED

TECHNICAL MEMORANDUM
TASK 23
HOT SPOT FEASIBILITY STUDY

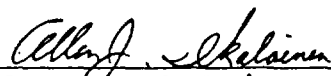
NEW BEDFORD HARBOR
BRISTOL COUNTY, MASSACHUSETTS

MARCH 1987


Prepared by:


Guy Wm. Vaillancourt
Environmental Engineer
E. C. Jordan Co.

Submitted by:


Allen V. Ikalainen, P.E.
Site Manager
E. C. Jordan Co.

Approved by:


Siegfried L. Stockinger, P.E.
Project Manager
Ebasco Services Incorporated

NOTICE

The information in this document has been funded by the United States Environmental Protection Agency (U.S. EPA) under REM III Contract NO. 68-01-7250 to Ebasco Services, Inc. (Ebasco). This document is a draft and has not been formally released by either Ebasco or the U.S. EPA. As a draft, this document should not be cited or quoted, and is being circulated only for comment.

TABLE OF CONTENTS

<u>SECTION</u>	<u>TITLE</u>	<u>PAGE NO.</u>
EXECUTIVE SUMMARY.		1
1.0	Introduction	2
2.0	Activity 23.1: Preliminary Volume Estimate of the Hot Spot	3
3.0	Activity 23.2: Scoping Response Actions	5
	3.1 Introduction.	5
	3.2 Factors Considered.	5
	3.3 Evaluation of Alternatives.	7
4.0	Conclusions.	10
APPENDIX A: COST SUMMARY.		11
APPENDIX B: COST SENSITIVITY ANALYSES		14
SENSITIVITY ANALYSIS SUMMARY		17
REFERENCES		18

LIST OF FIGURES

<u>FIGURE</u>	<u>TITLE</u>	<u>PAGE NO.</u>
1	PCB Preliminary Volume Estimate.	4

EXECUTIVE SUMMARY

A scoping study was performed to investigate if the Hot Spot portion of the Acushnet River Estuary could be removed for less than the \$2,000,000 cost ceiling as established in SARA for removal action. Four alternatives were developed for the removal or containment of this material. Two of the alternatives, in-harbor containment and dredging with temporary storage, were below this cost ceiling.

A detailed evaluation will be required if it is decided to pursue one of these alternatives. Things to be evaluated will include:

- results from the U.S. Army Corps of Engineers (USACE) Hot Spot sampling program;
- detailed engineering and cost analysis;
- monitoring of resuspension during construction or dredging;
- leachate monitoring from a containment area;
- assessment of anticipated interim performance of temporary storage or in-harbor containment; and
- hydraulic effects for the in-harbor containment alternative.

1.0 INTRODUCTION

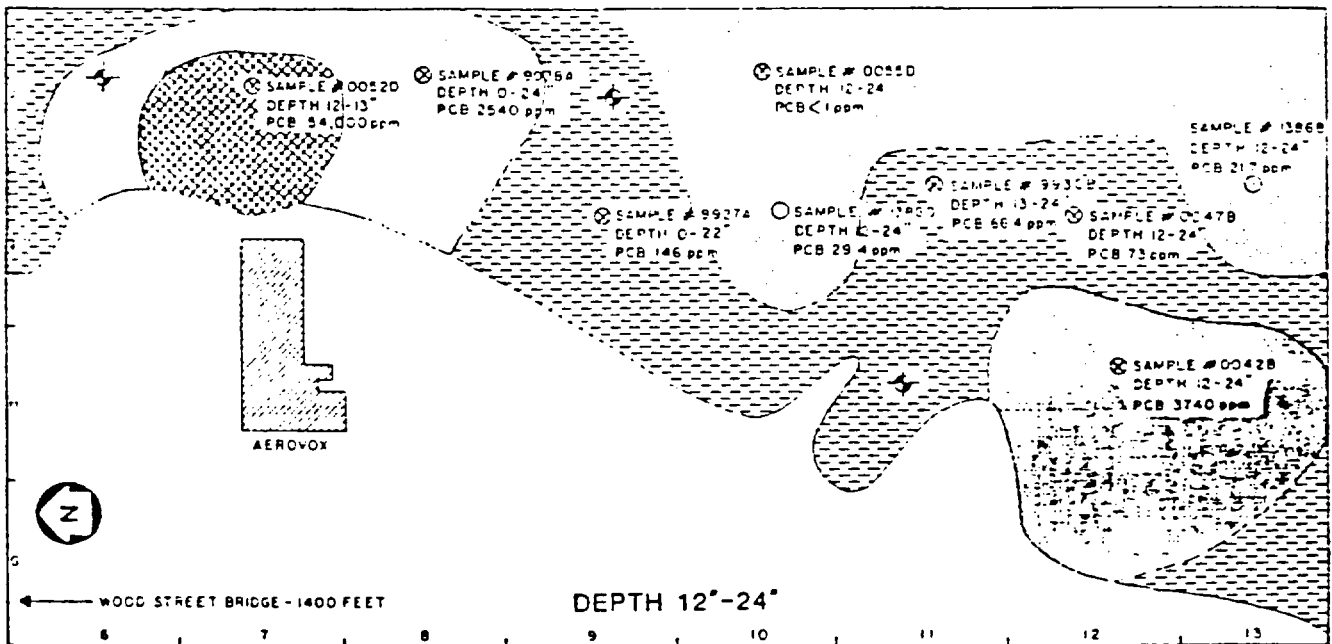
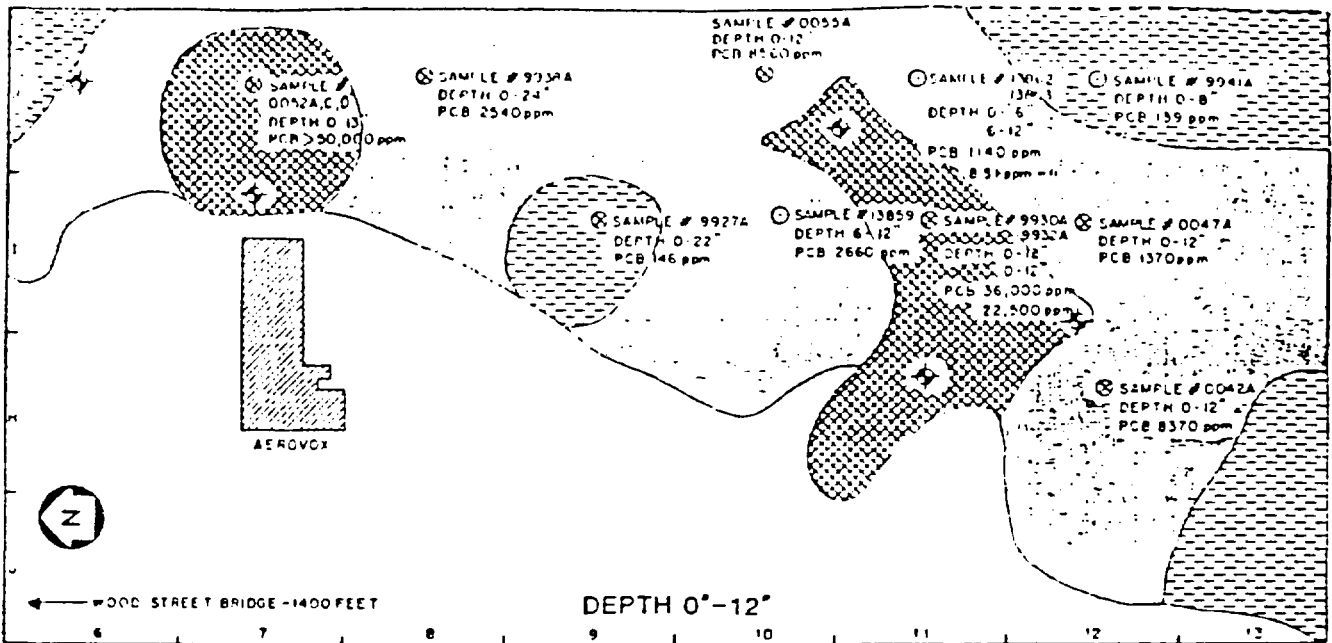
Within the estuary study area of the New Bedford Harbor site an area has been identified where sediment PCB concentrations exceed 10,000 ppm. This area has been termed the Hot Spot. The objectives of this task are:

- develop a preliminary volume estimate of the Hot Spot;
- scope response actions to determine if the Hot Spot should be addressed as a removal action or as a focused feasibility study; and
- design a removal action or develop a feasible alternative and cost.

This memorandum outlines the work completed to date under Activity 23.1: Preliminary Volume Estimate of the Hot Spot and Activity 23.2: Scoping Response Actions.

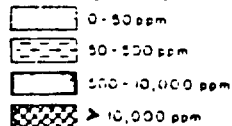
2.0 ACTIVITY 23.1: PRELIMINARY VOLUME ESTIMATE OF THE HOT SPOT

The objective of this activity was to develop a preliminary volume estimate utilizing the results of the U.S. Army Corps of Engineers (USACE) field sampling program and the resulting sample analyses by USACE and Battelle (Group 1 data). Maps were developed from this data to outline the physical limits of the PCB concentrations in the sediment of the Acushnet River Estuary. Figure 1 was developed from a section of these maps and illustrates the physical limits of the sediments that contain greater than 10,000 ppm. A preliminary volume estimate of 10,000 cubic yards was calculated based upon the boundaries delineated on this map. The accuracy of these calculations is estimated to ± 30 percent due to the location of the sample points and the non-mathematical contouring procedure used to determine the physical limits. A more accurate volume estimate will be made upon completion of the USACE Hot Spot field sampling program.



MAPS DEVELOPED FROM USACE SAMPLING GRID

LEGEND
PCB CONCENTRATION



- USACE SAMPLES - GROUP 3
- BATELLE HOT SPOT SAMPLES - GROUP 1
- PROPOSED SAMPLE LOCATIONS

DEPTH (IN)	AREA (FT ²)	VOLUME (YD ³)
0-12	209,500	7,763
12-24	66,211	2,432
TOTAL		~10,000

NEW BEDFORD HARBOR
ACUSHNET RIVER ESTUARY
PCB PRELIMINARY VOLUME ESTIMATE

3.0 ACTIVITY 23.2: SCOPING RESPONSE ACTIONS

3.1 INTRODUCTION

An evaluation was performed to determine if the Hot Spot should be addressed as a removal action (40 CFR 300.65) or as a remedial action (40 CFR 300.68). Factors considered in this evaluation were:

- a. Public health and environmental impacts of the Hot Spot;
- b. Alternative removal techniques;
- c. Destruction options on and off-site;
- d. Treatment options, including detoxification and fixation on and off-site;
- e. Disposal options on and off-site;
- f. Pre-treatment studies (bench scale), and;
- g. Costs.

3.2 FACTORS CONSIDERED

- a. Public health and environmental impacts of the Hot Spot - Specific public health and environmental impacts under current conditions in New Bedford Harbor are being evaluated under Task 06 risk assessment for the overall New Bedford Feasibility Study and will be available in August 1987. The risk assessment will give particular attention to the Hot Spot area, as this is an area of concentrated PCBs which account for approximately 30-40 percent of the PCB in the Acushnet River Estuary. Although restricted in size to approximately five acres, the high concentration of PCBs detected, their location near a populated area, and within the littoral zone (an area of easy access) suggests that the PCBs in the Hot Spot area presents a potentially significant risk to the exposed populations. The two major routes by which human exposure to the PCBs may occur are by direct dermal contact and inhalation. Exposure through these two routes may result in elevated body dose levels of PCBs and thus present a risk to public health. Adverse environmental impacts resulting from these high levels of PCBs are also expected. Given sediment PCB concentrations greater than 10,000 ppm suggests that PCBs are readily available in the water column in this area. PCB levels in the Acushnet River have been recorded in excess of 0.5 ppb, which exceed the Ambient Water Quality Criteria chronic exposure value for PCBs (Battelle 1986) set at 0.03 ppb and as such represent a potential risk to aquatic organisms. An additional environmental concern will be the uptake of PCBs by benthic organisms. Removal of the Hot Spot area would remove a substantial portion of the PCBs

from the estuary and aid in controlling PCB migration to the Acushnet River Estuary and New Bedford Harbor.

- b. Alternative Removal Techniques - Two alternative removal techniques are considered the most feasible for this area. The two techniques are hydraulic dredging and excavation. The advantage to hydraulic dredging the Hot Spot is that limited site preparation work is required. Site preparation work required would be the installation of sheet piling to prevent migration of the contaminants. The disadvantage to hydraulic dredging is that a dewatering facility is required.

Excavation is a viable removal technique. The Hot Spot areas can be dewatered by constructing embankments around the area and pumping the water to an adjacent inactive cell within the embankment area. The advantage to this method is that conventional excavation equipment (eg., clamshell, dragline) can be used and may require less extensive dewatering. The disadvantage to excavation is a substantial amount of embankment material must be filled and rehandled in order to provide access to the site for the equipment and also to dewater the work areas.

- c. Destruction Options On and Off-Site - Incineration was determined to be the most reliable, existing destruction technology. Although alternative destruction techniques are being evaluated in the New Bedford Harbor feasibility studies, they were not considered applicable to an accelerated removal action of the Hot Spot material. Off-site incineration was determined to be impractical due to the excessive distance to the closest licensed incinerator (Chicago, Illinois). Mobile incinerators are considered to be a viable option and are retained for this analysis.
- d. Treatment Options On and Off-Site - Several detoxification/fixation options were considered, however, they were not evaluated due to the volume of material being treated and/or the unproven technologies. Detoxification/fixation options considered were aerobic biological methods, solidification/fixation, and vitrification. These alternative treatment technologies and others are being further evaluated in the New Bedford Harbor feasibility studies, but they were not considered applicable to an accelerated removal action of the Hot Spot material.
- e. Disposal Options On and Off-Site - Several disposal options were considered for the Hot Spot material.

The disposal of the material in a licensed chemical waste facility is considered a viable alternative. Two licensed facilities, SCA Chemical Services, Inc. in Model City, New York (SCA) and CECOS International, Inc. in Ohio (CECOS) were evaluated. The temporary storage of this material until treatment technologies were implemented for the estuary/harbor/bay areas was also considered to be a viable option.

- f. Pre-treatment Studies (bench scale) - Pre-treatment studies were considered to be required for the dewatering of the dredged material and the testing of the water from the settling lagoon. If dredging is chosen as the removal technique, then a pre-treatment study will be required prior to field operation to verify the assumption of a 14-day retention period. Adequate solids dewatering will be required prior to handling the material for off-site disposal, temporary storage, or incineration. Pretreatment studies will also be required to determine if the water from the settling lagoon is of acceptable quality without water treatment, or if a water treatment system will be required.
- g. Costs - A cost analysis was performed for each alternative developed from the above information. Costs were obtained from cost procedure manuals, standard estimating techniques, and vendors. Cost information is included in Appendix A. In addition, cost sensitivity analyses were conducted for each alternative based on high and low volume calculations (+30%) and are included in Appendix B.

3.3 EVALUATION OF ALTERNATIVES

Three alternatives were developed for the removal and disposal/destruction of the Hot Spot material. One alternative was developed for in-harbor containment of the material. The four alternatives considered to be the most appropriate for the Hot Spot material are:

1. dredge/excavate the material with disposal in a licensed chemical waste landfill;
2. dredge/excavate the material with incineration of the sediment on-site utilizing a mobile incinerator;
3. dredge/excavate the material with temporary storage of the material; and
4. contain the material with an in-harbor embankment.

As three of the alternatives have a common dredging/excavation component, a cost evaluation was performed for each of these removal techniques. Hydraulic dredging costs include the costs for dredging and dewatering 10,000 cubic yards of material, and the costs for the installation of sheet piling. Excavation costs include the cost for fill material, excavation of 10,000 cubic yards of materials using a dragline, and the excavation of the fill material.

Dredging costs are estimated to be \$962,500. This does not include the costs for water treatment. If the water from the settling lagoon needs to be treated, then a carbon treatment system is proposed. Costs for carbon treating the water (coming from the settling lagoon) is estimated to cost \$130,000. An increase in costs may be needed to account for the addition of coagulants or an increase in retention time.

Excavation costs are estimated to be \$1.6 million. This cost is made up of two components: fill material placement at \$924,000, and excavation of the contaminated material and rehandle of the fill at \$660,000. Based on this analysis, hydraulic dredging appears to be the most cost effective removal technology.

Cost estimates were obtained for the disposal of the PCB sediment in a licensed chemical waste landfill. Two facilities were evaluated; SCA and CECOS. Disposal costs at the SCA facility were estimated at \$175/ton. In addition, transportation costs to the SCA facility were estimated at \$40/ton by rail. The total estimated cost to transport and dispose of this material at the SCA facility is \$215/ton.

Disposal costs at CECOS' facility were estimated at \$205/ton. In addition, rail transportation costs were estimated at \$57/ton. The total estimated cost to transport and dispose of this material at the CECOS Ohio facility is \$262/ton. The results of this analysis indicate that the SCA facility is presently the most cost effective. Compliance of these facilities with their environmental permits would be verified prior to the initiation of a remedial action.

Several vendors were contacted to obtain cost estimates for on-site incineration. Costs quoted included mobilization, demobilization, operation, and maintenance. A 20 percent factor was added for contractor profit and an additional 20 percent was added for contingency. The total cost estimate for the mobile incineration of this volume of material is \$500-\$600/ton.

A cost estimate was prepared for the construction of a temporary storage facility in the general New Bedford area. This facility would be a diked containment area with a synthetic liner installed on the top of the facility to prevent PCB volatilization and rain water penetration. The total cost for this facility is estimated at \$174,000.

The fourth alternative is to contain the 10,000 ppm sediment with an in-harbor embankment. This alternative involves the construction of embankments around the contaminated areas with spillways to handle excess surface water. The advantages of this alternative is that it encloses the highly contaminated areas and decreases PCB migration. The cost for this alternative is estimated at \$925,000.

The following summarizes the costs of the four alternatives:

- Alternative 1: Dredge/excavate the 10,000 ppm PCB sediment with disposal in a licensed chemical waste landfill.
 - Removal (Dredging) \$962,500
 - Transportation (SCA @ \$40/ton)* \$400,000
 - Disposal (SCA @ \$175/ton)* \$1,750,000

TOTAL COST \$3,112,500
- Alternative 2: Dredge/excavate the 10,000 ppm PCB sediment with incineration of the sediment on-site utilizing a mobile incinerator.
 - Removal (Dredging) \$962,500
 - Incineration (\$500-\$600/ton) \$5,500,000

TOTAL COST \$6,462,500
- Alternative 3: Dredge/excavate the 10,000 ppm PCB sediment with temporary storage of the material.
 - Removal (Dredging) \$962,500
 - Transportation (local - \$5/ton)* 50,000
 - Storage Facility 174,000

TOTAL COST \$1,186,500
- Alternative 4: Contain the 10,000 ppm PCB sediment with an in-harbor embankment.
 - Fill Placement and Construction \$1,000,000

* = Assumed Density - 1 ton/cubic yard

4.0 CONCLUSION

Alternative 3, dredge the >10,000 ppm PCB sediment with temporary storage of the material, and Alternative 4, contain the 10,000 ppm sediment with an in-harbor embankment, are the only alternatives below the two million dollar cost ceiling established for removal actions under the Superfund Amendment and Reauthorization Act of 1986.

If one of these alternatives is not chosen, then the dredging of the Hot Spot as a removal action may not be feasible because of the cost ceiling. The Hot Spot could be removed as an operable unit if it can be demonstrated that it is having an environmental impact on the estuary and there is a need to expedite the removal. A feasibility study would be required however, even if the material can be removed as an operable unit.

APPENDIX A
COST SUMMARY

1) Dredging Costs

- a) Sheet Piling - $16,000 \text{ ft}^2 \times \$12.50/\text{ft}^2$ (1)* - \$200,000
- b) Dredge (Mudcat MC - 915)
 - $10,000 \text{ yd}^3 - 75 \text{ yd}^3/\text{hr} \implies 135 \text{ hours}$
 - Mudcat MC-915 Lease with accessories (400 hour minimum) - \$62,500 (2)
- c) Dewater by Settling Lagoon
 - Mudcat can pump up to 3,500 ft.
 - Assume mudcat dredges at 10% solids
 - Assume 14 day retention time
 - Settling lagoon requires $56,000 \text{ yd}^3$ of embankment fill material. $56,000 \text{ yd}^3 \times \$12/\text{yd}^3$ (3) \approx \$700,000

Total Cost - \$962,500

2) Water Treatment Costs

- a) Activated Carbon Water Treatment Costs - \$130,000 (10)
 - Double Stage System - \$70,000
 - System Operation $\$3,500/\text{Month} \times 6 \text{ Months}$ - \$21,000
 - Disposal of Spent Carbon - \$10,000
 - Treatability Study - \$3,000
 - Contingency 25% - \$26,000

* Numbers in parenthesis indicate specific reference which are included at the end of this appendix.

3) Excavation Costs

- a) Assumptions - Dragline w/80' boom; fill material contaminated to a two foot depth; fill from local area; embankment - 30 foot top width, 10 foot height with 2H:1V side slopes
- b) Fill Material Required (subbase, base, gravel) - 77,000 yd³
 - 77,000 yd³ @ \$12/yd³(3) ==> \$924,000
- c) Contaminated Material Removal
 - PCB Sediment - 10,000 yd³
 - Contaminated Fill - 40,000 yd³
 - Total 50,000 yd³
 - Cost Estimate @ \$4.10/yd³ (1), inflated to 1987 dollars - \$6.60/yd³, plus 25% due to Level B ==> \$8.25/yd³
 - 50,000 yd³ x \$8.25/yd³ - \$412,500
- d) Non-contaminated Fill Removal
 - 37,000 yd³ x \$6.60/yd³ ==> \$244,000

Total Cost - \$1,580,000

4) Transportation and Disposal Cost Summary**

- a) SCA (Model City, New York)
 - Transportation - \$40/ton (4)
 - Disposal - \$175/ton (5)
- b) CECOS (Ohio)
 - Transportation - \$57/ton (4)
 - Disposal - \$205/ton (6)

** Note all calculations are based on 10,000 yd³ and assume no addition of coagulant/stabilizing agent.

5) Mobile Incineration Cost Summary

- a) Infrared Incineration \$100-200/ton (7)
- b) Fluidized Bed Incineration \$300-500/ton (8)
- c) Rotary Kiln Incineration \$400-600/ton (9)

6) Temporary Storage Facility Costs

- a) Embankment Summary - 15' top width'; 10' high; side slopes 2H:1V
- b) Fill material required ~ 12,000 yds³
 - 12,000 yd³ x \$12/yd³ (3) = \$144,000
- c) Cost for seal on top of storage area
 - Geotextile Fabric (Level B Protection) - \$1.32/yd²
 - Inflate cost to 1987 dollars - \$2.13/yd²
 - Liner size - 250 ft x 250 ft - 62,500 ft²
 - 62,500 ft² x \$2.13/yd² = \$15,000
 - Add 100% for liner contingency - \$15,000
 - Total Liner Cost - \$30,000

Total Cost - \$174,000

7) In-Harbor Embankment Costs

- a) Fill Material Required -
77,000 yd³ x \$12/yd³ (3) = \$924,000
- b) Spillway Installation - \$75,000 (Estimated)

Total Cost - \$1,000,000

APPENDIX B
COST SENSITIVITY ANALYSIS

- Base case volume of material to be treated -
10,000 yd³
- High side sensitivity (+30%) - 13,000 yd³
- Low Side Sensitivity (-30%) - 7,000 yd³

Alternative 1: Dredge the 10,000 ppm PCB sediment with disposal in a licensed chemical waste landfill.

High Side -

- 1) Dredging
 - a) Sheet Piling - \$200,000
 - b) Dredge (Mudcat MC-915) - \$62,500
 - c) Dewatering - \$800,000
- 2) Transportation (SCA) - \$520,000
- 3) Disposal (SCA) - \$2,275,000

Total Cost (High Side) \$3,857,500

Low Side -

- 1) Dredging
 - a) Sheet Piling - \$200,000
 - b) Dredge (Mudcat MC-915) - \$62,500
 - c) Dewatering - \$800,000*
- 2) Transportation (SCA) - \$280,000
- 3) Disposal (SCA) - \$1,225,000

Total Cost (Low Side) - \$2,567,500

* Cost does not change due to retention time remaining constant at 14 days

Alternative 2: Dredge the 10,000 ppm PCB sediment with incineration of the sediment on-site utilizing a mobile incineration.

High Side -

- 1) Dredging
 - a) Sheet Piling - \$200,000
 - b) Dredge (Mudcat MC - 915) - \$62,500
 - c) Dewatering - \$800,000
 - 2) Mobile Incineration - \$7,150,000
- Total Cost (High Side) - \$8,212,500

Low Side -

- 1) Dredging
 - a) Sheet Piling - \$200,000
 - b) Dredge (Mudcat MC - 915) - \$62,500
 - c) Dewatering - \$800,000
 - 2) Mobile Incineration - \$3,850,000
- Total Cost (Low Side) - \$4,912,500

Alternative 3: Dredge the 10,000 ppm PCB sediment with temporary storage of the material.

High Side -

- 1) Dredging
 - a) Sheet Piling - \$200,000
 - b) Dredge (Mudcat MC - 915) - \$62,500
 - c) Dewatering - \$800,000
 - 2) Transportation (Local) - \$65,000
 - 3) Storage Facility
 - a) Fill - \$170,000
 - b) Liner - \$42,000
- Total Cost (High Side) - \$1,339,500

Low Side -

- 1) Dredging
 - a) Sheet Piling - \$200,000
 - b) Dredge (Mudcat MC - 915) - \$62,500
 - c) Dewatering - \$800,000
- 2) Transportation (Local) - \$35,000
- 3) Storage Facility
 - a) Fill - \$85,000
 - b) Liner - \$18,000

Total Cost (Low Side) - \$1,200,500

Alternative 4: Contain the 10,000 ppm PCB sediment with an in-harbor embankment.

High Side -

- 1) Fill - \$1,201,200
- 2) Spillway Installation - \$75,000

Total Cost (High Side) - \$1,276,200

Low Side -

- 1) Fill - \$646,800
- 2) Spillway Installation \$75,000

Total Cost (Low Side) - \$721,800

REFERENCES

- (1) Compendium of Costs of Remedial Technologies at Hazardous Waste Sites, Hazardous Waste Engineering Research Laboratory, Office of Research and Development, U.S. EPA, September 1985
- (2) Mudcat Division, National Car Rental, 2337 Lemoine Avenue, Fort Lee, New Jersey 07024, (201) 461-5665, March 1985
- (3) Estimated Cost of Fill Material in Massachusetts, E.C. Jordan Company Estimating Department, October 1986
- (4) Telecon: H.P. Krahn (E.C. Jordan) with T. Cooke (Conrail Railroad), 10/24/86, (617) 828-3356
- (5) Telecon: H.P. Krahn (E.C. Jordan) with P. Cook (SCA Chemical Services), 10/01/86, (716) 754-8231
- (6) Telecon: H.P. Krahn (E.C. Jordan) with D. Krause (CECOS International) 10/01/86, 10/27/86, (716) 282-2676
- (7) Telecon: R. Hathaway (E.C. Jordan) with G. Hay (Shirco Infrared Syste MS, Inc.), 07/14/86, (214) 630-7511
- (8) Telecon: R. Hathaway (E.C. Jordan) with D. Young (G.A. Technologies), 07/14/86, (619) 455-2383
- (9) Telecon: R. Hathaway (E.C. Jordan) with T. Scott (Ensco), 07/15/86, (501) 376-8142
- (10) Telecon: J.J. Sczurko (E.C. Jordan) with Dave Jordan (Calgon Corp.), 03/13/87, (201) 526-4646